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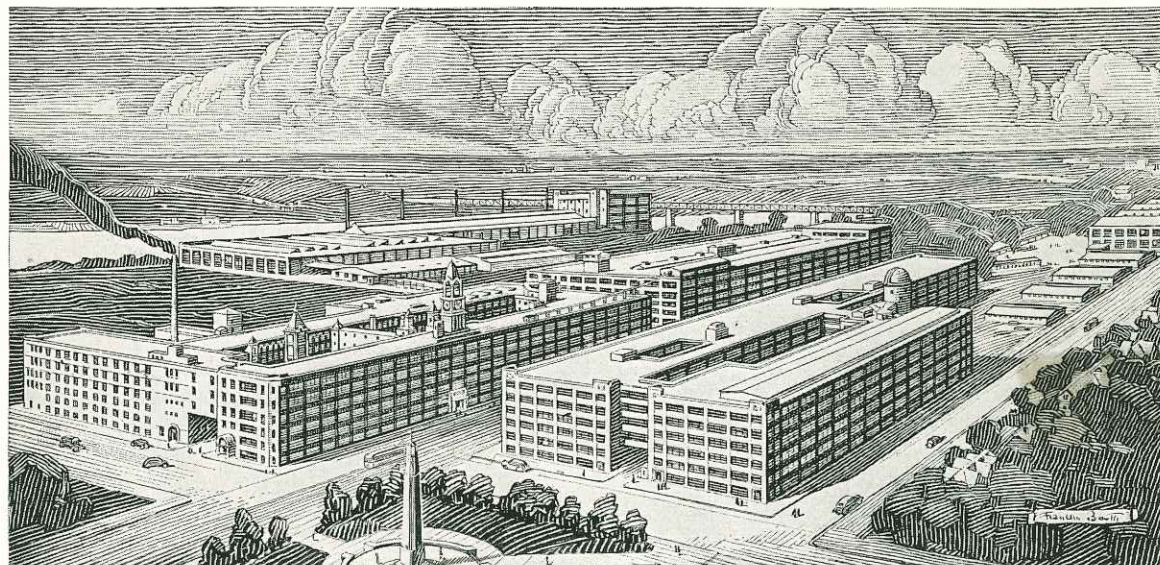
Bausch & Lomb

**POLARIZING
MICROSCOPES
AND
ACCESSORIES**



359/371

36*



That eyes may see better and farther

Unsurpassed precision characterizes Bausch & Lomb microscopes, photographic lenses, spectrographs, and other optical instruments serving Science, Industry, and Education. This precision is also reflected in Bausch & Lomb ophthalmic lenses, eyewear, and instruments for visual examination.

Vision is taken for granted and frequently ignored in the belief that the eyes are functioning well. However, impartial tests reveal that the perfect eye is a rarity, and that seven persons in every ten require glasses. Since 83% of mental impressions are said to be received through the eye, an impairment of vision reduces mental efficiency.

As years go by, visual imperfections vary, whether or not complicated by added defects. Hence the need for periodical re-examinations.

To provide the highest possible level of normal vision, Bausch & Lomb scientists have developed Orthogon Wide-Vision Lenses, Panoptik Bifocals, Loxit Rimless Mountings, and a wide variety of Ophthalmic Instruments to aid eyesight specialists, who each year furnish millions of patients with Bausch & Lomb eyewear.

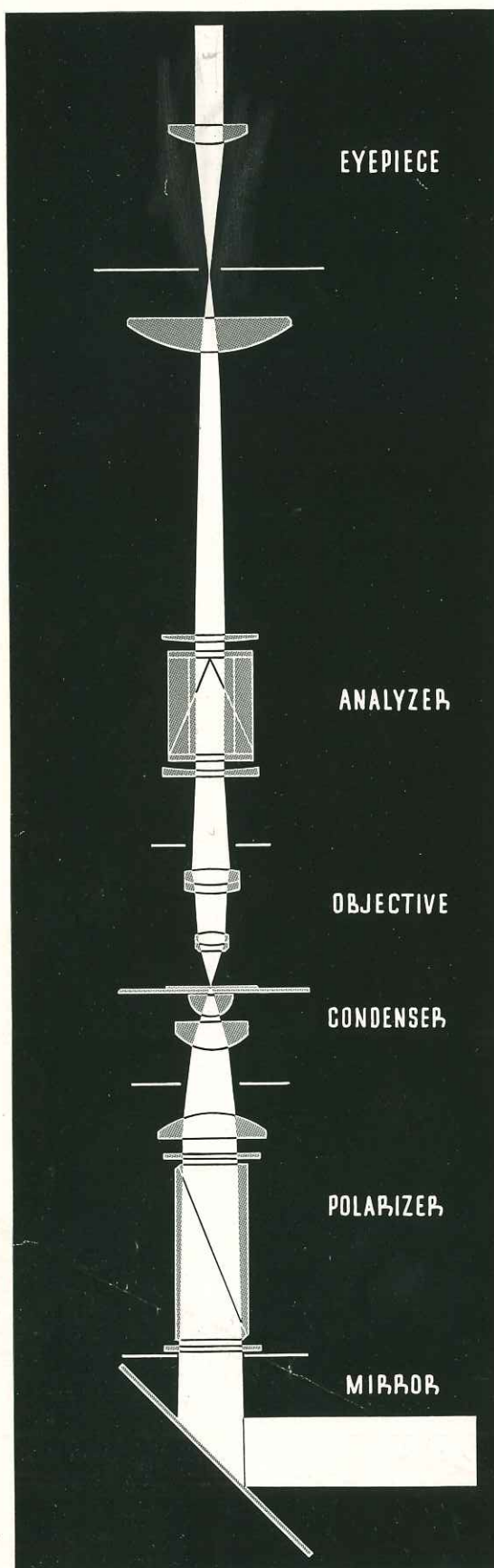
Be sure your eyes, too, enjoy the protection and comfort afforded by Bausch & Lomb quality.



POLARIZING MICROSCOPES AND ACCESSORIES



The illustrations in this catalog show Bausch & Lomb scientific instruments of current production. However, due to our constant efforts to improve and refine, this company reserves the right to supply apparatus that may differ in unimportant or minor details from those shown in the illustrations.



Path of light through a Polarizing Microscope

ABOUT POLARIZING MICROSCOPES

In Polarizing Microscopes, as in other lines of optical instruments, Bausch & Lomb has consistently pioneered definite improvements. For example, users of the earlier Polarizing Microscopes will remember the change in magnification, shift of forms due to astigmatism, which resulted when the tube analyzer was inserted. B&L optical engineers worked out a method for overcoming these difficulties and now all tube analyzers are corrected for all three conditions—focus difference, magnification and astigmatism.

Another point carefully considered in the design and construction of all Bausch & Lomb Polarizing Microscopes is the strain-free condition of the optics themselves, as well as the mounting of all optical parts, such as objectives, condensers, covers for polarizers and analyzers, free from mechanical strain. Therefore, B&L Polarizing Microscopes give clear, sharp interference figures, and the field appears evenly black under crossed Nicols when no specimen is on the stage.

The Polarizing Microscope, simply equipped with a fixed polarizer and analyzer, was much used in the early days of microscopy and is now taking its place in science and industry (in a somewhat more elaborate design). It will perform the functions of an ordinary microscope and go a great deal further in determining properties and characteristics which

could be determined in no other way.

All transparent substances may be examined advantageously with the Polarizing Microscope. All such substances fall into one of two classes. Either they are optically homogeneous, that is, have but one refractive index; or they are optically inhomogeneous, that is, they have more than one refractive index. The first are called isotropic and the second anisotropic. The latter type constitutes most of the transparent objects studied in polarized light. They may be characterized and identified by extinction angle, bi-refringence, optic axial angle, optical elongation, optic sign, interference figure, etc.

The use of a Polarizing Microscope is no longer confined to the field of petrography. Doctor Emile Chamot pioneered the use of the Polarizing Microscope in the field of chemical microscopy. This field in turn has spread to embrace most of the industrial phases of chemistry and has been taken up by other workers in other fields of science. Today we are no longer surprised to find optical characteristics of organic chemicals as a part of the International Critical Tables. We read from time to time in the textile journals of work being done on textile fibers with the Polarizing Microscope; of the degree of nitration in certain rayons being determined by means of the Polarizing Micro-

scope. We read of a metallographer using polarized light in connection with vertical illumination to carry on his researches. We learn of the investigation of slags and the determination thereby of mineral composition which is extremely important to know in connection with the chemical composition. The mining industry is using the Polarizing Microscope in connection with vertical illumination to examine those ores and metals which are not transparent and cannot be examined in thin sections. The botanist and zoologist frequently find use for the Polarizing Microscope.

The pioneer work has been done in many fields and the results tabulated and made available to the worker who wishes to follow. However, in many fields the work still remains to be done. For you who are interested in the possibilities of this instrument in your work, we suggest you write us outlining your problems.

Advanced Methods

For those who are familiar with the conventional crystallographic or petrographic method, we recommend a thorough investigation of the Fed-

eroff Universal Stage with the extra added motion, which does away with much calculation in the measurement of optic axial angles.

We also suggest the Emmons Double Variation Equipment as providing the most accurate means at present for determining the refractive index of small crystal grains. These equipments find a wide field in soil mineralogy and similar work.

Bausch & Lomb is the acknowledged leader and pioneer in this field, and is intent on maintaining this position.

What Microscope to Buy

The following general facts are offered for your guidance in selecting your Bausch & Lomb Polarizing Microscope.

The cost of a polarizing microscope is governed by the size of polarizing prisms, their type of mounting, the complexity of the mechanical mountings and microscope stands, the number of optical and mechanical accessories, and the choice of objectives and eyepieces.

For example, the Chemical Microscope M is equipped with an eye cap analyzer, the LA with a body tube analyzer, the LB and LC with a ro-

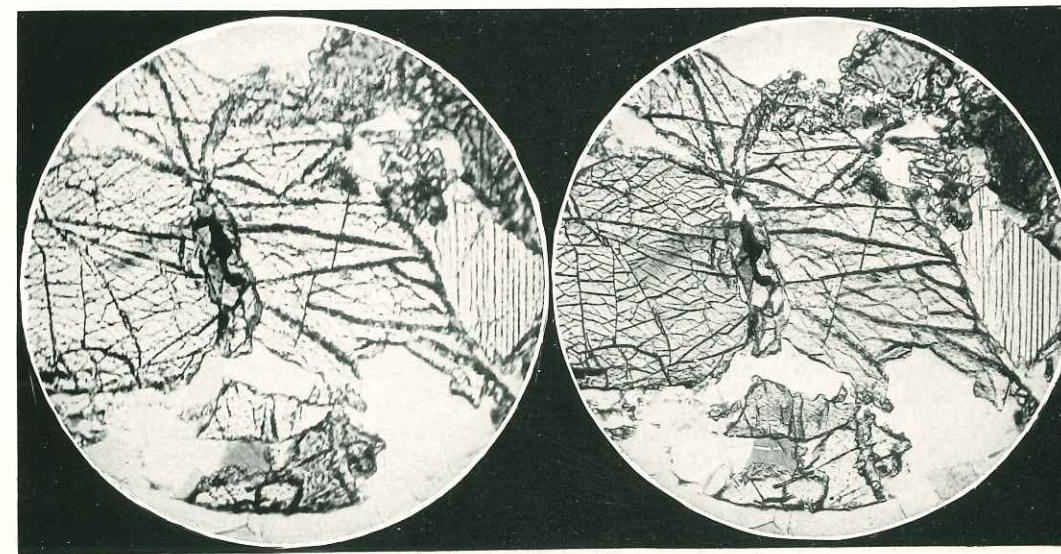
tating built-in analyzer, and the LD with a device for simultaneous rotation of both polarizer and analyzer. The cost is greater with each step in complexity, although each has its uses and advantages.

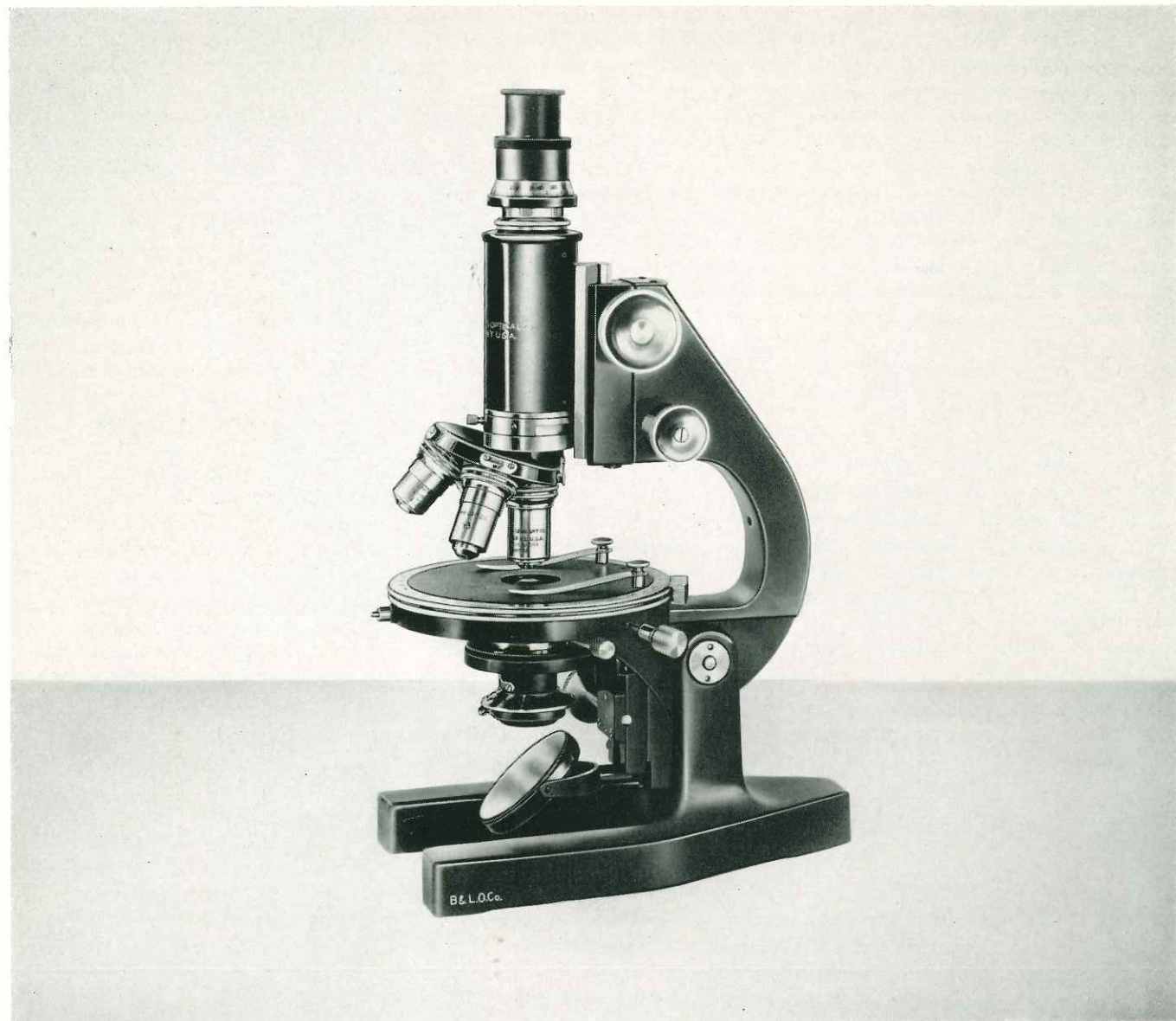
Note, also, that the stage is centerable on the Chemical Microscope M, but not the objectives. In the LA, LB, and LC, the objectives are centerable, giving the greater accuracy necessary with higher power objectives, while in the LD both objectives and stage are centerable, the latter permitting direct measurement of length and breadth.

The Chemical Microscope M is not equipped with a Bertrand lens but in the LA, LB and LC we find a Bertrand lens, which, in the LC is centerable and equipped with diaphragm. In the LD we have, in addition, the Wright auxiliary lens mounted above the Bertrand.

It is sound economy to anticipate future needs and to choose a Polarizing Microscope somewhat in advance of immediate requirements. Frequently, in the normal course of work, new uses and applications are developed in which the conveniences and adaptability of the more complete equipment are desirable.

These two pictures show the same rock section, photographed with an ordinary and with a stigmatic analyzer. In the left illustration, the vertical lines are in focus, while the horizontal lines are not sharp and the lines at other angles are poorly defined. The illustration at the right shows an even definition throughout the field, characteristic of results with a stigmatic analyzer.





CHEMICAL MICROSCOPE M

WE are indebted to Drs. E. M. Chamot and C. W. Mason of the Laboratory of Chemical Microscopy, Cornell University, for the features incorporated in this microscope.

The Chemical Microscope is equipped with a revolving nosepiece and centerable stage, a necessity in following reactions under the micro-

scope. For similar reasons an eyecap analyzer is used. It is thus raised high from the stage and possible attack from chemical fumes, and is completely removable for the many types of chemical microscopy.

The study of opaque objects requires vertical illumination. Much work is being done in this field with polarized light. The M Microscope,

when suitably equipped with vertical illumination and polarizer, offers an ideal equipment for this work.

With proper accessories it may be used for dark field work, metallography, bacteriology, particle size determination, photomicrography and textile work.

The Stand is sturdy, with curved arm and horseshoe base.

The Body Tube, 39mm in diameter, is supplied with graduated draw tube for using micrometer accessories. A slot with shutter holds accessories in lower end of body tube.

The Focusing Adjustments include the standard Bausch & Lomb coarse adjustment and the durable side fine adjustment, which ceases to act when objective touches cover glass. Each graduation indicates 2 microns of vertical movement.

The Nosepiece is a dustproof, revolving type holding the objectives in parfocal position.

The Stage is centering, circular, revolving, and graduated in single degrees with each tenth line numbered; the double vernier with clamp screw reading to 3 minutes in both directions. The stage is 125mm in diameter, and the Mechanical Stage No. 31-59-54 fits directly into the stage clip holes.

The Substage is focused by diagonal rack and pinion. The ring will take any Bausch & Lomb substage condenser or polarizer.

The Finish is black and chromium, alcohol- and reagent-proof.

The Case is neatly finished hardwood, with handle, lock and key.

The Mirror, 50mm in diameter, has

plane and concave surfaces, is fork mounted, adjustable in two planes.

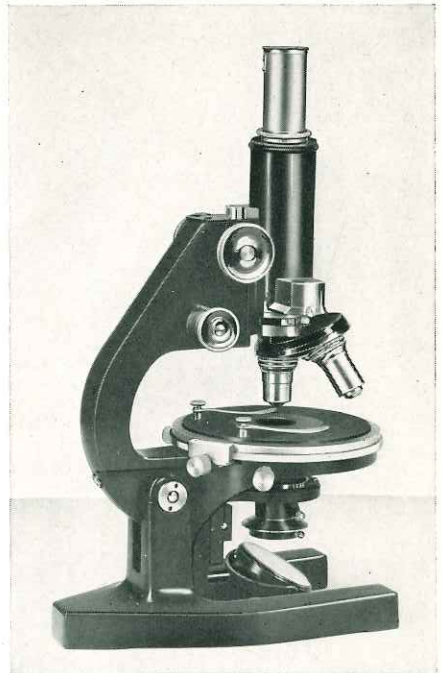
The Style E Polarizer is for parallel light and consists of a Nicol prism set in a revolving mount, graduated in intervals of 15 degrees. If convergent polarized light is to be used, order equipment with Style F Polarizer. It has a two-lens condenser of 1.10 N.A. mounted on a swinging arm with stop for quick change from convergent to parallel light.

The Analyzer is Style B. It fits over the eyepiece and has a Glan Thompson prism in a revolving mount, graduated in 2° divisions. There are some applications wherein a body tube analyzer with its larger field and convenience in changing to ordinary light both in visual and photographic work are desirable. To meet these conditions a body tube non-rotatable analyzer is available as optional equipment in place of cap analyzer.

The Objectives are achromatic—selected for strain-free characteristics, mounted in threadless cells without cement.

The Eyepieces are of the Huygenian type, with focusing eye lenses, cross hairs and locating pin.

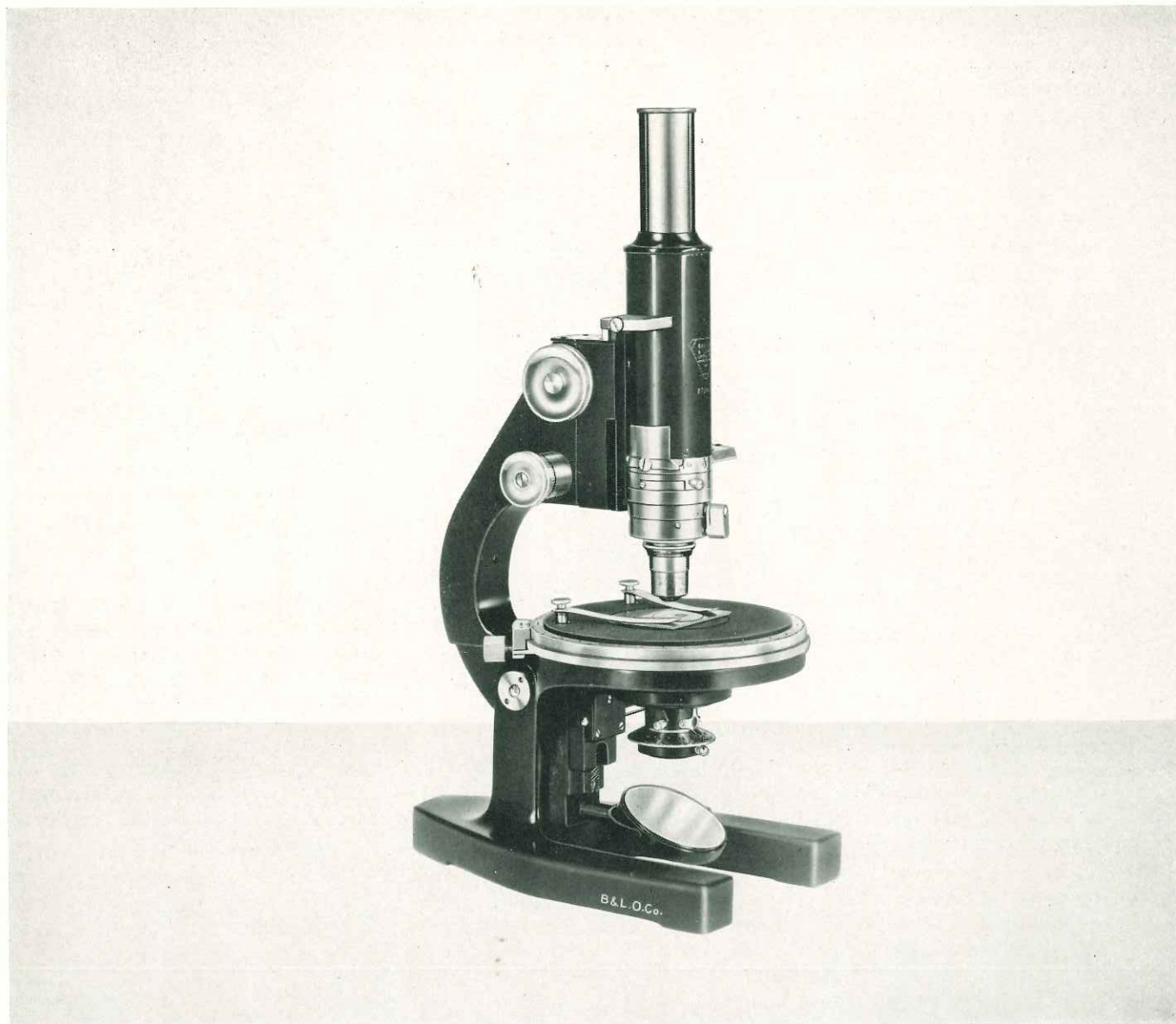
Available accessories are selenite



The M Microscope can be supplied with non-rotating body tube analyzer (shown above) in place of the cap analyzer. When so desired, specify in order.

plate (red of the first order), one quartz wedge, and one quarter wave plate mounted to fit slot in body tube. For prices, see Price List.

Catalog Number	Code Word	Dry Objectives	Cross Hair Eyepieces	Nosepiece	Polarizer
31-28-51-01	Ajozh	10× (16mm), 21× (8mm)	10, 12.5	Single	E
31-28-51-02	Ajpan	10× (16mm), 21× (8mm)	10, 12.5	Double	E
31-28-51-04	Ajpep	4× (32mm), 10× (16mm), 21× (8mm)	5, 7.5, 10 12.5	Triple	E
31-28-51-51	Ajpir	10× (16mm), 21× (8mm)	10, 12.5	Single	F
31-28-51-52	Ajpos	10× (16mm), 21× (8mm)	10, 12.5	Double	F
31-28-51-54	Ajput	4× (32mm), 10× (16mm), 21× (8mm)	5, 7.5, 10 12.5	Triple	F
31-51-68	Accah	Magnifying Lens, mounted for interference figure work			
31-58-74-28	Ajory	Abbe Condenser, 1.25 N.A.			
31-59-54	Ahefg	Mechanical Stage, as described on page 17			
31-51-43	Ajses	Johannsen Compensator			
31-51-54	Accik	Quarter Wave Plate			
31-51-56	Ahamm	Quartz Wedge			
31-51-60	Ahann	Selenite Plate			
Accessories for Reflected Light					
31-59-30	Ahaff	Auxiliary Stage, fitting substage for use in metallurgical work			
31-34-89-93	Acraw	Vertical Illuminator Body with plane clear glass reflector, iris diaphragm and condenser mounted in side tube			
31-57-27	Ahavv	Side Tube Polarizer, Style G, attaches to side tube on above Vertical Illuminator (Strain-Free Objectives selected for work with polarized light)			
31-08-21-01	Ahazz	16mm Achromatic Objective (short mount) for uncovered objects			
31-08-31-01	Ahbaw	4mm Achromatic Objective (short mount) for uncovered objects Other powers—prices on request.			



PETROGRAPHICAL MICROSCOPE LA

THIS is a complete, though simple, microscope for use in petrographical and crystallographical studies—a thoroughly efficient student instrument.

In place of a cap analyzer as on the M, the LA is fitted with a sliding body tube analyzer which provides a larger field and quick change from ordinary to polarized light. It

has the additional advantage of permitting convenient change of eyepieces.

The Stand is a strong conservative type, with curved arm and horseshoe base.

The Body Tube has a diameter of 39mm. A notch in the upper edge of the eyepiece tube provides for fixing the azimuth of the eyepiece.

The Bertrand Lens (non-focusable) slides in and out of the body tube. Pin hole cap is included. It fits the eyepiece tube for observing interference figures after Lasaulx method.

The analyzer box slides in and out of the body tube, and a slot with dustproof shutter for accessories is placed just beneath the analyzer.

The Focusing Adjustment consists

of a diagonal rack and pinion coarse adjustment and a side fine adjustment which is graduated in 100 parts, each division equaling 2 microns. The fine adjustment ceases to act when the objective touches the slide, protecting it against accidental breakage.

The Nosepiece carries a single objective and permits quick interchange of any number of standard objectives. It also provides means for accurate and rapid centering of the individual objective so that each may be replaced by another without disturbing the centering accomplished. It consists of two parts: the tube part, and the objective part. The tube part has the usual Society screw thread and attaches to the body tube. The objective part, one for each objective, contains the centering device worked by two keys. The Nosepiece is self-compensating for wear.

The Stage is circular, revolving, centered and graduated in single degrees, with each tenth line numbered, the double vernier with clamp screw reading to 3 minutes in both directions. The diameter of the stage 125mm. The Mechanical Stage No. 31-59-54 fits directly in the stage clip holes.

The Substage is the standard diagonal rack and pinion type carrying the polarizer and condenser. It

will take any Bausch & Lomb substage condenser or polarizer.

The Finish is black and chromium, alcohol- and reagent-proof.

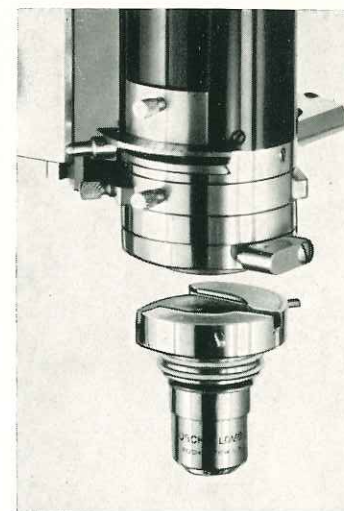
The Case is of neatly finished hardwood, fitted with a handle, lock and key.

The Polarizer is Style F, consisting of a Nicol prism set in a revolving mount, which is graduated in two-degree parts with every tenth line numbered. The entire mounting is supported in a substage and fixed for zero point by a stud which engages a corresponding slot. A two-lens condenser 1.10 N.A., the top lens of which is mounted on a double bracket swing-out arm, has a stop for quick change from convergent to parallel light. The lower lens used alone is 0.22 N.A. An iris diaphragm is beneath the polarizer.

The Analyzer is a Glan Thompson prism set in a sliding prism box, allowing withdrawal and return to the optical axis. It is provided with stigmatizing lenses, mounted permanently in body tube, to minimize astigmatism and to reduce shift of focus.

The Objectives are achromatic and selected for strain-free characteristics, mounted in threadless cells without cement.

The Eyepieces are of standard diameter Huygenian type, with focusing eye lenses, cross hairs, and



The Centering Nosepiece used on LA, LB, LC and LD is centerable with two keys

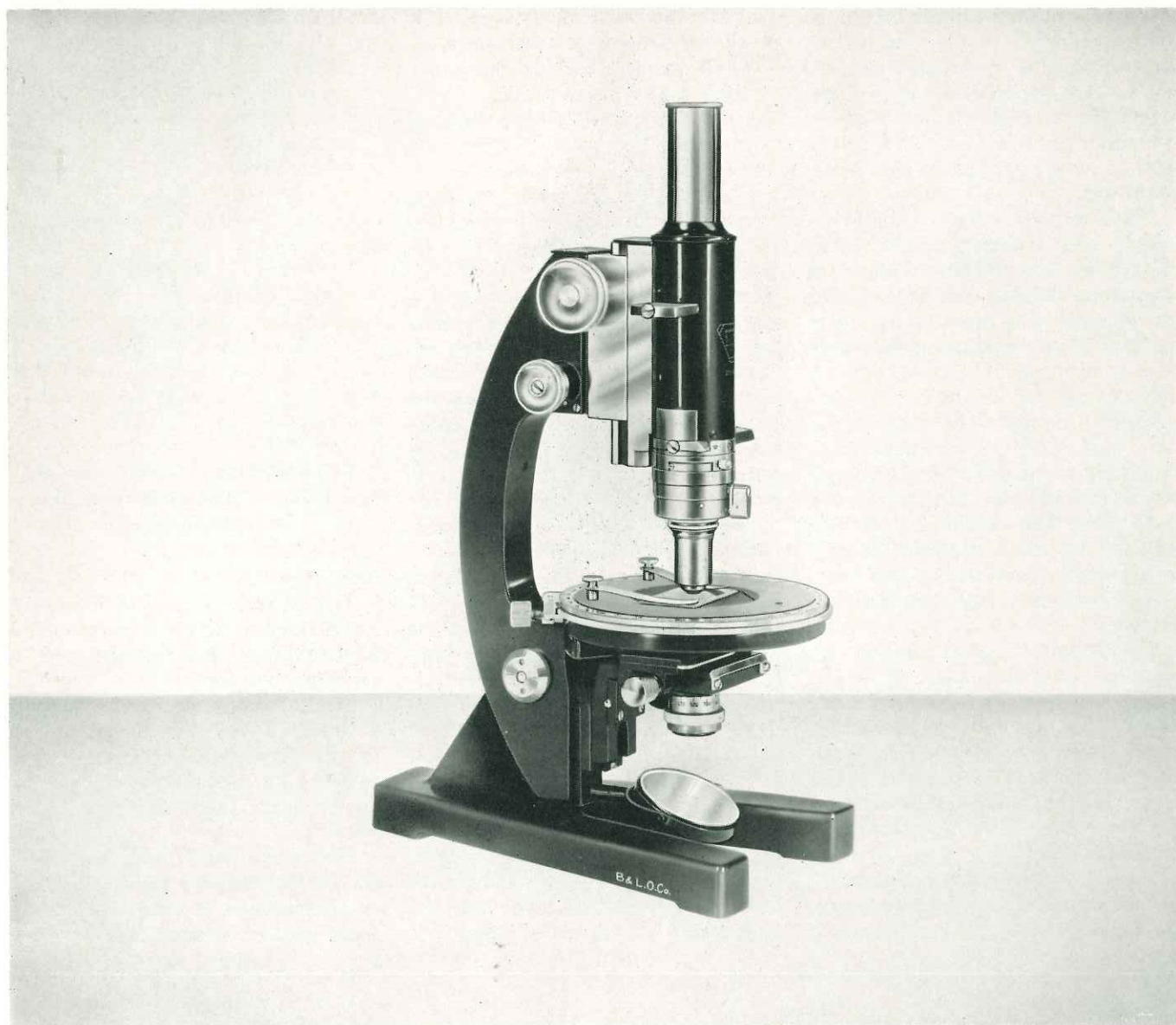
locating pin.

The Mirror, 50mm in diameter, has plane and concave surfaces. It is adjustable in two planes and is mounted in a fork.

Available accessories are one selenite plate (red of the first order), one quartz wedge, one quarter wave plate—each mounted to fit into slot in the body tube. For prices, see Price List.

The magnifying lens, No. 31-51-68, is required for the observation of interference figures when Bertrand Lens is not supplied.

Catalog Number	Code Word	Objectives with Centering Nosepiece	Cross Hair Eyepieces	Polarizer	
31-28-54-12	Ajrot	10× (16mm), 45× (4mm)	7.5, 10	F	
31-28-54-14	Ajruv	4× (32mm), 10× (16mm), 45× (4mm)	7.5, 10, 12.5	F	
31-51-68	Accah	Magnifying Lens, mounted for interference figure work.			
31-58-74-28	Ajory	Abbe Condenser, 1.25 N.A.			
31-59-54	Ahefg	Mechanical Stage, as described on page 17			
31-51-54	Accik	Quarter Wave Plate			
31-51-56	Ahamm	Quartz Wedge			
31-51-60	Ahann	Selenite Plate			
Accessories for Reflected Light					
31-59-30	Ahaff	Auxiliary Stage, fitting substage for use in metallurgical work.			
31-34-89-93	Acrav	Vertical Illuminator Body with plane clear glass reflector, iris diaphragm and condenser mounted in side tube.			
31-57-27	Ahavv	Side Tube Polarizer, Style G, attaches to side tube on above Vertical Illuminator. (Strain-Free Objectives selected for work with polarized light)			
31-08-21-01	Ahazz	16mm Achromatic Objective (short mount) for uncovered objects.			
31-08-31-01	Ahbaw	4mm Achromatic Objective (short mount) for uncovered objects. Other Powers—prices on request.			



POLARIZING MICROSCOPE LB

THE Polarizing Microscope LB is designed for more comprehensive work in petrography and crystallography.

The Stand is characterized by ample dimensions for easy manipulation, rigidity, stability and convenience in use.

The Body Tube has a diameter of 39mm. A notch in the upper edge of

the eyepiece tube provides for fixing the azimuth of the eyepiece. The Bertrand Lens (non-focusable) slides in and out of the body tube. Pin hole cap is included. It fits the eyepiece tube for observing interference figures after the Lasaulx method. The analyzer box slides in and out of the body tube, and a slot with dustproof shutter for accessories is placed just

beneath the analyzer.

Focusing Adjustments. The coarse adjustment is by diagonal rack and pinion with stop to prevent the pinion from overriding the rack. The fine adjustment is of the improved side type, in which the pitch of the screw is such that each graduation on the drum is equivalent to 2 microns of movement. This greatly

simplifies measurements of depth and thickness. To adapt the regular coarse adjustment to this model, which must have clearance for the Federoff Universal Stage, it was necessary to make the rack much longer. This results in a superior steadiness of the body tube in relation to the specimen.

The Nosepiece carries a single objective and permits quick interchange of any number of standard objectives. It also provides means for accurate and rapid centering of the individual objective so that each may be replaced by another without disturbing the centering accomplished. It consists of two parts: the tube part, and the objective part. The tube part has the usual Society screw thread and attaches to the body tube. The objective part, one for each objective, contains the centering device worked by two keys. The Nosepiece is self-compensating.

The Stage is circular, revolving, centered and graduated in single degrees, with each tenth line numbered, the double vernier with clamp screw reading to 3 minutes in both directions. The diameter of the

stage 125mm. The stage is drilled and tapped to receive the Federoff Universal Stage.

The Finish is black and chromium, alcohol- and reagent-proof.

The Case is polished hardwood, with handle, lock and key.

The Substage is regularly supplied with a 1.10 N.A. condenser fitted with iris diaphragm. The condenser is provided with a means for swinging the upper lens out of the optical axis, resulting in 0.28 N.A., used to illuminate the larger field of a 16mm objective. The condenser unit is mounted on a slide, which dovetails into the substage fitting. The entire substage is focusable by rack and pinion.

An Achromatic Condenser 1.40 N.A. is available to interchange with the regular 1.10 N.A. condenser. This is a three-lens, separable type, giving 0.65 N.A. with the top lens removed, and 0.28 N.A. with both upper lenses removed.

The Eyepieces are Huygenian type, fitted with cross hairs and focusing eye lens.

The Objectives are achromatic, selected for strain-free characteris-

tics, mounted in threadless cells without cement.

The Polarizer is a Glan Thompson prism in rotatable mounting, graduated in 15° intervals, and can be rotated 360°, with detent marking the zero location.

The Analyzer is of the stigmatic tube type, having an Ahrens prism, which slides between the stigmatizing lenses and is rotatable through 90°, graduated in 5° intervals. The stigmatizing lenses are not carried on the Ahrens prism mount, but are fixed permanently in the body tube, so that no change in magnification results when introducing or removing the analyzer, and no change in focus is required.

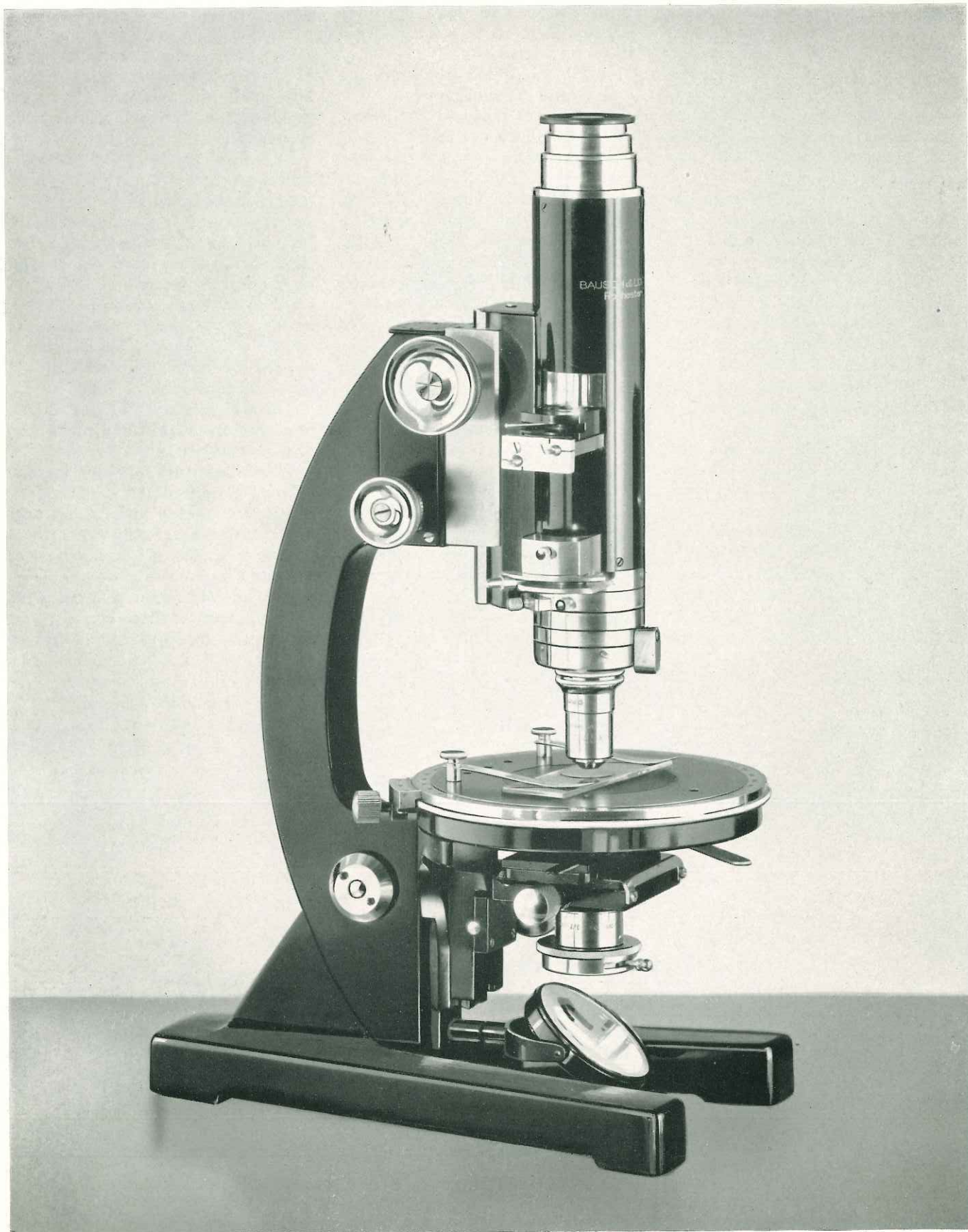
The Mirror is fork mounted, 50mm in diameter and has one plane and one concave surface.

The Accessories included are one selenite plate (red of the first order), one quartz wedge and one quarter undulation plate. These are each in a slide to fit the slot in the base of the body tube.

The LB Microscope can be fitted with Mechanical Stage No. 31-59-54 illustrated on page 17.

Catalog Number	Code Word	Objectives with Centering Nosepiece	Cross Hair Eyepieces
31-28-58-02	Ajsar	10× (16mm), 45× (4mm)	7.5×, 10×
31-28-58-04	Ajsov	2.6× (40mm), 10× (16mm), 45× (4mm)	5×, 7.5×, 10×
Accessories			
31-59-54	Ahefg	Mechanical Stage, as described on page 17	
31-58-40	Ajucl	Condenser, 1.10 N.A. with diaphragm on slide	
31-58-42	Ahapp	Immersion Condenser, 1.40 N.A., interchangeable with 1.10 N.A. Condenser	
31-51-68	Accah	Magnifying Lens, mounted for interference work	

Focusing Stage can be supplied at extra cost.



BAUSCH & LOMB PETROGRAPHICAL MICROSCOPE LC

PETROGRAPHICAL MICROSCOPE LC

THE LC Polarizing Microscope has been designed to offer an instrument provided with the optics and precision required for research work in general, yet sturdy enough for years of routine work in teaching or industry.

Its outstanding features are: interchangeable condensers (1.10 N.A. and 1.40 N.A.); extra clearance of arm and body tube which allows the use of the Universal Stage and great working space; large diameter eyepieces which give a larger field; new design, quick changing, centerable nosepiece; centering Bertrand Lens focusable by sliding tube; provisions for accessories for measurement of optical characteristics; large, massive stand; improved Polarizer and Analyzer; ball-bearing stage.

The Stand has superior balance and stability. The curved arm provides an abundance of working space at the stage and adequately accommodates the Federoff Universal Stage. The V-shaped base with its long heel aids steadiness in inclined positions.

The Body Tube is 39mm in diameter. Notches in the upper edge of the eyepiece tube provide for fixing the azimuth of the eyepiece. The rotatable, graduated analyzer slides in and out of the body tube, and a slot, with adjustable shutter, for accessories is placed just beneath the analyzer.

The Bertrand Lens is mounted in a focusable sleeve above the analyzer. It is centerable by keys in the same manner as the objective. It is of large size, gives a brilliant interference figure and is easily removed for cleaning.

Focusing Adjustments. The coarse adjustment is by diagonal rack and pinion with a stop to prevent the pinion from overriding the rack. The fine adjustment is of the improved

side type, in which the pitch of the screw is such that each graduation on the drum is equivalent to 2 microns of movement. This greatly simplifies measurements of depth and thickness. To adapt the regular coarse adjustment to this model, which must have clearance for the Federoff Universal Stage, it was necessary to make the rack much longer. This results in a superior steadiness of the body tube in relation to the specimen.

The Nosepiece carries a single objective and permits quick interchange of any number of standard objectives. It also provides means for accurate and rapid centering of the individual objective so that each may be replaced by another without disturbing the centering accomplished. It consists of two parts: the tube part, and the objective part. The tube part has the usual Society screw thread and attaches to the body tube. The objective part, one for each objective, contains the centering device worked by two keys. The Nosepiece is self-compensating.

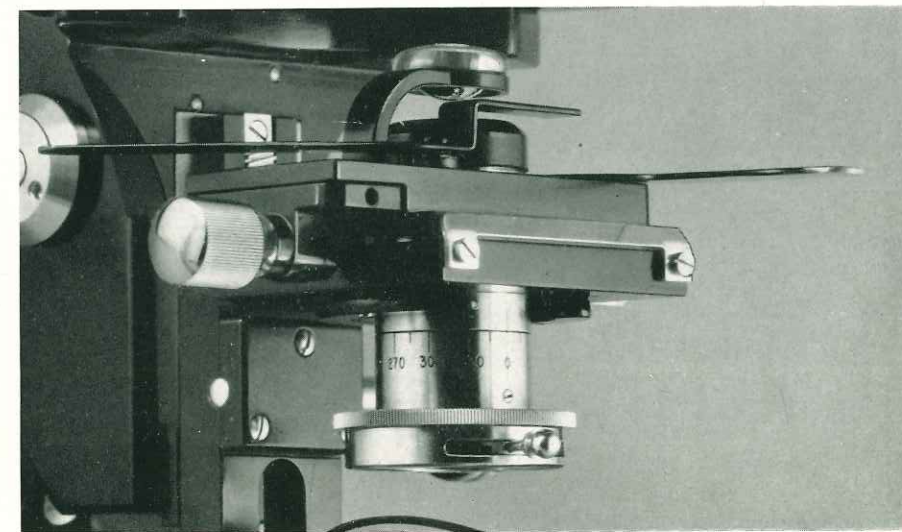
The Ball-Bearing Stage is circular, revolving, centered and graduated in single degrees, with each tenth line numbered, the double vernier with clamp screw reading to 3 minutes in both directions. The diameter of the stage is 125mm. It revolves freely, yet has no float or play under high magnifications. The stage is drilled and tapped to receive the Federoff Universal Stage.

The Substage is focusable by diagonal rack and pinion and carries the polarizer and condenser. The swing-out condenser is mounted on a slide over the polarizer and is removable.

The Condenser, 1.10 N.A., is carried on a sliding mount, which is equipped with an iris diaphragm, provided with means for swinging the upper lens out of the optical axis, leaving 0.28 N.A. to illuminate the larger field required when working with the 16mm objective.

An adjustable shadow plate is provided to facilitate Becke line tests for index measurements.

The condenser is mounted on a slide over the polarizer



BAUSCH & LOMB POLARIZING MICROSCOPES

An Achromatic Condenser, 1.40 N.A., interchangeable with the standard 1.10 N.A., is available. This is a three-lens condenser of the achromatic type. With the top lens removed the numerical aperture is 0.65 and with upper two lenses removed the numerical aperture is 0.28.

The Polarizer is a Glan Thompson prism in a rotatable mounting fitted with an iris diaphragm. This polarizer is graduated in 15° intervals, can be rotated 360° and has a detent to locate it at the zero position.

The Analyzer is of the stigmatic tube type, having an Ahrens prism, which slides between the stigmatizing lenses and is rotatable through 90°, graduated in 5° intervals. The stigmatizing lenses are not carried on the Ahrens prism mount, but are fixed permanently in the body tube, so that no change in magnification results when introducing or removing the analyzer, and no change in focus is required.

The Eyepieces are of the Huygenian type of large diameter with exceptionally large field, and are equipped with cross hairs and focusing eye lenses. An adapter for taking a standard diameter eyepiece and the Universal Holder and Positive Eyepiece and accessories is supplied with each microscope.

The Objectives are achromatic—selected for strain-free characteristics, mounted in threadless cells, without cement. They are carried in a drawer type case, within the large microscope cabinet.

The Mirror, 50mm in diameter, has plane and concave surfaces. It is adjustable in two planes and is mounted in a fork. The mirror can be swung off the optical axis for obtaining oblique illumination. Its fork mount slides vertically on the mirror bar.

Accessories furnished include a quartz wedge, selenite plate (red of the first order), a quarter wave plate and pinhole cap. The pinhole cap fits the eyepiece tube for observing interference figures after Lasaulx Method.

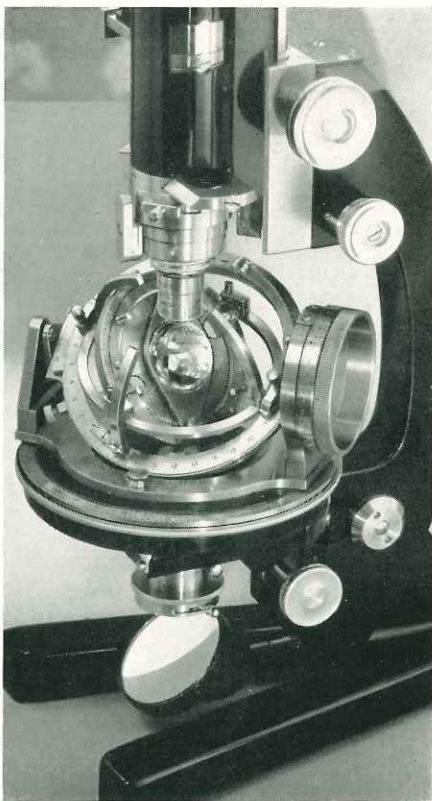
The Aplanatic Auxiliary Magnifier is available to facilitate interference figure determinations on small crystal grains. See Price List.

Also available is the Johannsen Compensator which consists of a quartz wedge plus a retardation plate (red of the first order). It fits into the slot in the body of the microscope in the same way as the quartz wedge.

Mechanical Stage No. 31-59-54 fits directly into the stage clip holes.

The Finish is black and chromium, alcohol- and reagent-proof.

The Case is hardwood, highly pol-

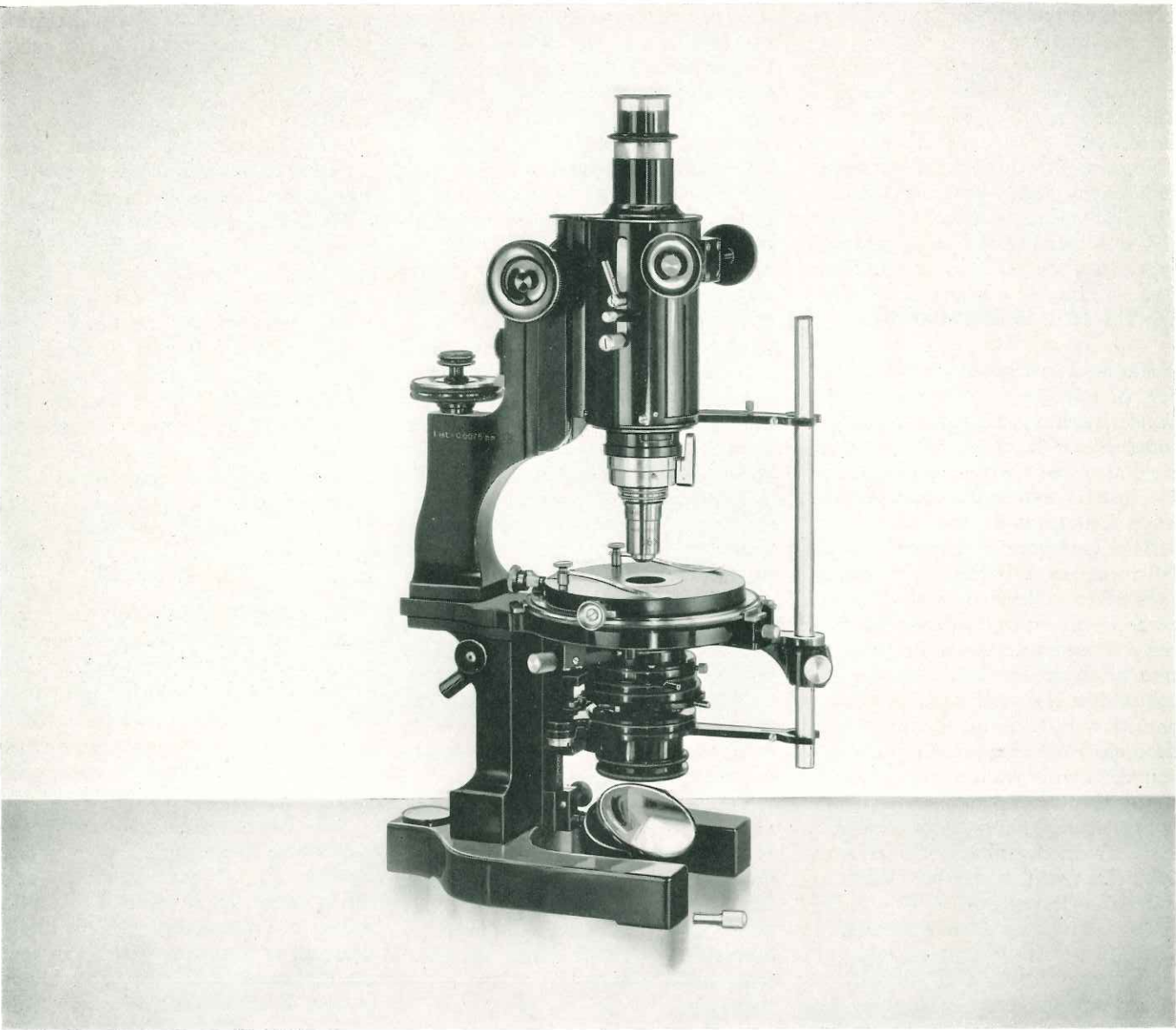


Ample clearance for the Federoff Universal Stage is provided in the LC Microscope

ished, with convenient fittings for eyepieces and covered drawer for objectives and accessories (wedge, mica plates and selenite plate).

Catalog Number	Code Word	Objectives with Centering Nosepiece	Cross Hair Eyepieces
31-28-61-02	Ahelm	10× (16mm), 45× (4mm, 0.85 N.A.)	7.5×, 10×
31-28-61-04	Agmad	2.6× (40mm), 10× (16mm), 45× (4mm, 0.85 N.A.)	5×, 7.5×, 10×
Accessories			
31-59-54	Ahefg	Mechanical Stage as described on page 17	
31-58-41	Ajudm	Condenser 1.10 N.A., with diaphragm and Becke eccentric shutter, interchangeable with 1.40 N.A. Condenser	
31-58-42	Ahapp	Immersion Condenser 1.40 N.A. Interchangeable with 1.10 N.A. Condenser, for use on LC Microscope	
31-19-12	Ajtiv	Objective Holder for quick change nosepiece on LC Microscope	
31-59-75	Ajacg	Federoff Universal Stage (after Emmons), including two pairs of hemispheres Nd. 1.516 and 1.649, with glass stage, screwdriver, two screws for clamping to stage of LC Microscope, complete in case	
31-51-43	Ajses	Johannsen Compensator	
31-51-49	Ajsit	Aplanatic Auxiliary Magnifier	

Focusing Stage can be supplied at extra cost.



PETROGRAPHICAL MICROSCOPE LD

THE Petrographical Microscope LD is a completely equipped instrument for petrography. It is intended for research work.

This instrument was made to the design of Dr. F. E. Wright, Carnegie Institute, Washington, D. C.

The Body Tube has an outside diameter of 55mm, with an inner tube adjustable by rack and pinion

(two heads) through a range of 25-mm. The inner tube contains a Bertrand Lens with an auxiliary lens above it and an iris diaphragm below it, each being adjustable from the right hand side of the body tube. The draw tube slides in a metal fitting, graduated in single millimeters and numbered 160, 170 and 180. It takes standard size eyepieces (23mm

diameter) which are supplied with cross hairs and with the eye lens adjustable for focusing upon them. The slot in the upper edge of the draw tube fixes the azimuth of the eyepiece. The analyzer mounted within the lower portion of the body tube slides in and out of the optical axis on a rotating arm. A 45° slot with a dustproof shutter is placed in the

body tube just beneath the analyzer for accessories.

The Focusing Adjustments include a coarse adjustment by diagonal rack and pinion and the top fine adjustment graduated in 100 parts, each equal to 0.0025mm of vertical movement, and provided with a vernier sliding vertically to follow the rise and the fall of the micrometer head for reading to 0.005mm. The mechanism ceases to act when the objective touches the slide.

The Nosepiece is of the interchangeable centering type, consisting of two parts—the upper part, which has a Society screw thread for attaching to the body tube, and the objective part, which has a centering device actuated by means of two keys. (See page 9.)

The Polarizer is a 16mm Ahrens prism set in a revolving mount attached to a swinging arm, which permits the complete removal from the optical axis. Above the polarizer and attached to the iris diaphragm mount is a removable carrier for the sensitive tint plate (20mm outside diameter), which is carried in a sliding mount, allowing its removal from the optical axis.

The Illuminating Apparatus consists of an Aplanatic Condenser, 1.40 N.A., with upper two lenses removable, giving 0.40 N.A. with the lower lens alone. This condenser is placed in a fixed substage arm with a small set screw and is easily removable. Below it is fitted an iris diaphragm.

The Stage is of the revolving type with a clamping device to set it in any desired position. The circumference is graduated in single degrees with each tenth line numbered, the two verniers reading to

0.1 degree. Two additional verniers, also reading to 0.1 degree, are attached to the support of the bar connecting the Nicols. The outside diameter of the graduated circle is 112mm. Mounted on the revolving stage is an adjustable stage plate 95mm in diameter, with mechanical cross movements actuated by graduated heads set 90° apart—the graduations reading to 0.01mm—with a range of 12mm each way. The stage aperture, 32mm, is fitted with a reducing disc having an aperture of 18mm.

The Substage is adjustable by rack and pinion. It carries the condenser, iris diaphragm, selenite plate and the polarizer.

The Finish is smooth black. The smaller adjusting heads and the bar are chromium plated, and the graduated circles are German silver. The entire finish is alcohol-proof.

The Case is of hardwood with polished finish, fitted with lock and key and handle.

The Analyzer is the stigmatic type Glan Thompson prism fitted with stigmatizing lenses to compensate for a change of optical path upon inserting and withdrawing the analyzer from the tube. It also corrects astigmatism introduced by the analyzer. It is revolvable a quarter turn and set in a sliding prism bar which allows its withdrawal from the optical axis entirely within the body tube.

Simultaneous Rotation of Nicols

A rigid bar is supported at the plane of the stage by an arm moving through 90 degrees, fitted with two verniers to provide for reading the

angle of rotation. Connection arms with broad bearing surfaces, extending from the analyzer and polarizer carriers, engage the bar in such a way as to permit free movement of the body tube and substage when focusing and to eliminate lost motion. The bar is movable in its support for instant release of the arms, allowing independent rotation of the polarizer or the analyzer. A clamping device with a milled head on one of the verniers sets the bar support against rotation, to permit the polarization planes of the Nicols to be set parallel with the cross hairs of the eyepiece and to provide for rotating the specimen on the stage rather than rotating connected Nicols.

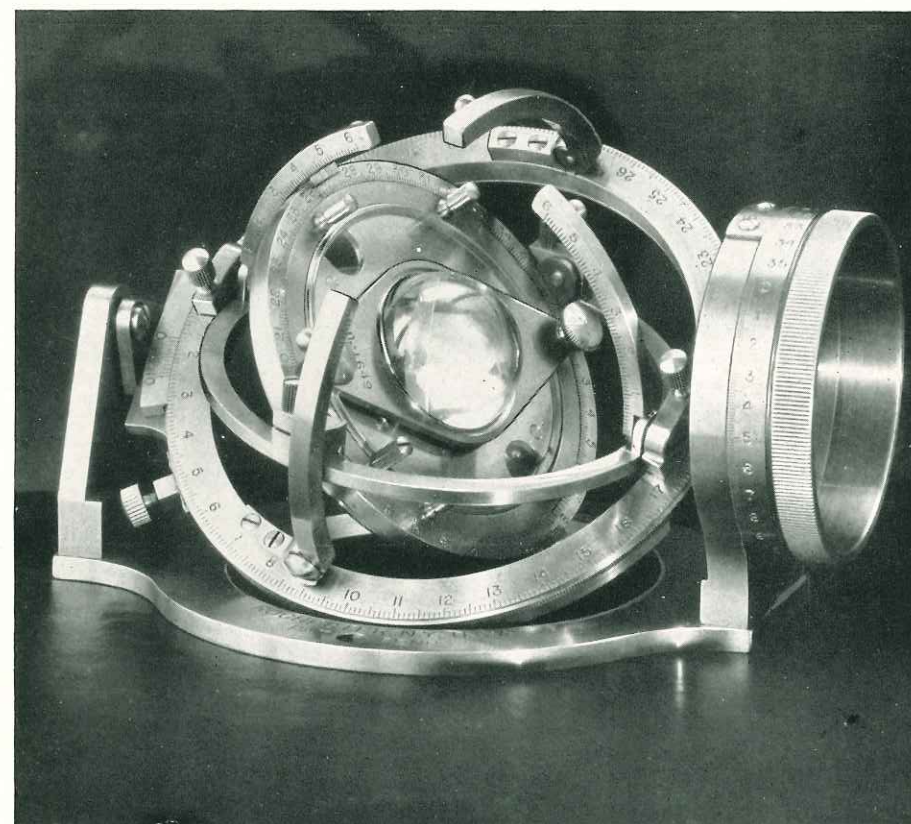
The Objectives are achromatic—selected for strain-free characteristics, mounted in threadless cells without cement.

The Eyepieces are of the Huygenian type with focusing eye lenses, cross hairs and locating pin.

The Mirror, 50mm in diameter, has plane and concave surfaces. It is adjustable in two planes and is mounted in a fork. It is adjustable along the substage support.

The Accessories included consist of one selenite plate, one quartz wedge and one quarter wave plate, all mounted to fit a slot above the centering nosepiece. One selenite plate is mounted and slides in and out of the axis at the substage. There is also a slide plate to carry blue glass and ground glass for insertion below the condenser iris diaphragm when the sensitive tint plate is withdrawn from the optical axis.

Accessories for accurate quantitative measurement of optical properties are listed on pages 18 and 19.



Federoff Universal Stage, No. 31-59-75, is supplied with focusing feature used for high magnification and to compensate for various slide thicknesses

FEDEROFF UNIVERSAL STAGE with Five Rotary Axes

NEW speed and simplicity have been attained for making refractive index determinations of crystal grains.

The use of the Federoff Stage, long advocated by leading petrographers, has been simplified through a modification consisting of an additional horizontal axis of rotation which is parallel to the east-west horizontal axis. This was developed at the suggestion of Doctor R. C. Emmons, University of Wisconsin, who writes in the "American Mineralogist" of December 1929—"The universal stage, instead of being an accurate but time consuming instrument, has become a time saving instrument with added accuracy."

The new axis makes it possible to rotate a crystal on two mutually perpendicular and horizontal axes after the crystal has been oriented

with one of the axes of optic indicatrix vertical. This is important, since a rotation on the east-west horizontal axis is nearly always necessary in order to bring one of the desired mineral axes into vertical position.

The widespread use of this device in the determination of optical characteristics makes it desirable that every undergraduate student in petrography at least be introduced to its use. Dr. Emmons states that students were able to make certain

routine tests on feldspar with this stage after one hour's instruction. Industrial applications in ceramics and abrasives, and refractories are important. Its use in accurate refractive index measurements is indispensable and optic axial angles are determinable with greater accuracy than interference figure methods will give.

MECHANICAL STAGE

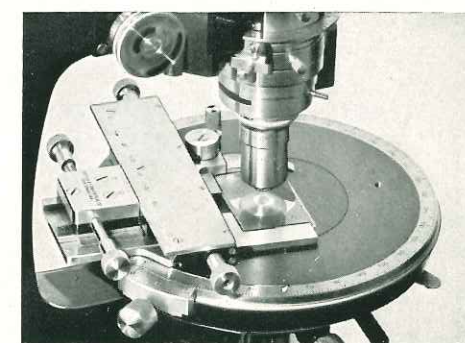
It is often desirable to thoroughly explore a slide or to record the position of certain fields being viewed. Mechanical stages offer the necessary facilities for doing such work systematically, quickly and accurately.

The mechanical stage is held in place by two screws which fit into the tapped clip holes of the stage. It is easily fitted into position or removed.

This stage is chromium plated and equipped with graduated scales and verniers for both movements. The actuating buttons are of convenient size and operate from either the right or left side. Both movements travel at the same speed.

A spring-actuated finger will hold securely slides 25 x 75mm or can be set to hold standard petrographic half slides.

Mechanical Stage, No. 31-59-54



Catalog Number	Code Word	Objectives with Centering Nosepiece	Cross Hair Eyepieces
31-28-57-02	Acdaj	10× (16mm), 36× (4mm, 0.95 N.A.)	7.5, 10
31-28-57-04	Acdek	4× (32mm), 10× (16mm), 36× (4mm, 0.95 N.A.)	7.5, 10, 12.5

Catalog Number	Code Word	Specifications
31-59-75	Ajacg	Federoff Universal Stage with 5 rotary axes. Includes 2 pairs of hemispheres Nd. 1.516 and 1.649 with glass stage, screwdriver, 2 screws for clamping to microscope stage, and case . .
31-59-54	Ahefg	Mechanical Stage, for circular stage microscopes

OPTICAL ACCESSORIES



Style A
Analyzer

Style B
Analyzer

Style C
Analyzer
Polarizer

Style F
Polarizer

Style H
Polarizer

Style E
Polarizer

Polarizers and Analyzers

FOR merely recognizing anisotropic material, it is sufficient to add a simple polarizer and analyzer to any conventional microscope. In every case both a polarizer and an analyzer are required. In every combination it is desirable that one element be graduated.

For the determination of extinction angles and other optical char-

acteristics, it is necessary that the microscope be fitted with a graduated, revolving stage and cross hair eyepiece.

Combinations

The following combinations have proved desirable in practice:

Analyzer A with either Polarizer E or F. (Ungraduated analyzer—graduated polarizer.)

Analyzer B with either Polarizer

C or H. (Graduated analyzer—ungraduated polarizer.)

Polarizers C, E, and F will fit into the condenser ring (38mm inside diameter) of the simple rack and pinion substage on the Bausch & Lomb Microscopes.

Analyzer A

Analyzer A is a simple ungraduated rotatable analyzer customarily attached to the lower end of the body tube. It is threaded to receive the objective.

Analyzer B

Analyzer B is designed for use above the eyepiece. It is provided with a collar fitting the top of the microscope tube. It has a Glan Thompson Prism, rotatable 360° and graduated in 2° divisions.

Polarizers C and E

Polarizer C is a simple ungraduated polarizer without condensing lenses.

Polarizer E is a simple graduated and rotatable polarizer without condensing lenses.

Polarizer F

Polarizer F is a complete substage polarizing equipment for both parallel and convergent light. The polarizer is rotatable and graduated in 2° intervals numbered every 20°. The condenser of 1.10 N.A. is mounted on a swing-out arm with iris diaphragm and stop for quick change. Using lower lens only the N.A. is 0.22.

Polarizer H

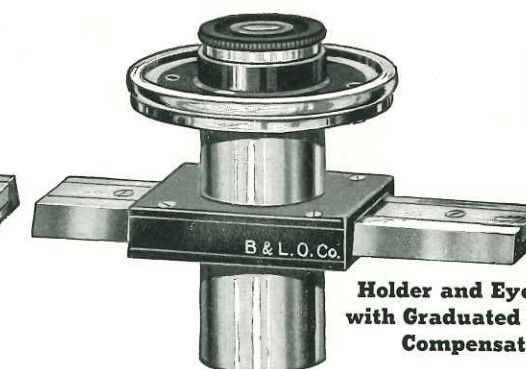
Polarizer H is a simple ungraduated polarizer in a drop-in mounting. It fits the research substage on the



Cap Analyzer



Bi-Quartz Wedge Plate



Holder and Eyepiece
with Graduated Quartz
Compensator

GG and DDE microscopes; i.e., by removing the condenser with its slide it is possible to drop the polarizer into place. The condenser is then returned to position for use.

Retardation Plate

Three Retardation Plates, in metal cells fitting into the top of the polarizer mount, are available for use with Polarizers C, E, and H.

The condenser on the polarizer may be used independently or in combination.

Micrometers

Micrometer discs are available and a special 7.5× eyepiece with focusing eye lens is listed to hold them. The value of the graduations when used with various objectives is determined with the stage or micrometer.

Measuring Accessories

The following accessories are offered for accurate quantitative measurement of optical properties:

The Universal Holder and Positive Eyepiece may be used with any model petrographical microscope. It is essentially a carrier or holder for the following optical accessories.

The Graduated Quartz Wedge is used in the above holder. It measures the path of difference and is read off directly, each division equalling 10mμ for sodium light. This is essential for the determination of bi-refringence.

The Bi-Quartz Wedge Plate is used to obtain very accurate readings of extinction angles. The customary accuracy with ordinary methods is ±10'. Much greater accuracy is obtained with the bi-quartz wedge.

The Cap Analyzer with 2° graduation permits accurate setting of the index point with zero of the analyzer.

The Sliding Stop Eyepiece is for the observation of interference fig-

ures from fine mineral grains. It consists essentially of two adjustable slits at right angles with special eyepiece for focusing on them.

A Co-ordinate Grating, 0.1mm divisions, for measurement of optic axial angles and statistical mineral volume analysis by the percentage area method, is available.

The Johannsen Compensator consists of a quartz wedge and a quarter wave plate, red of the first order, mounted to fit into the slot in the microscope body tube.

Objectives and Eyepieces

The formulae of Bausch & Lomb

Objectives and Eyepieces are based upon the most precise and carefully worked out computations.

Bausch & Lomb has made the technical equipment for producing high grade optical work the object of constant care and, as a final guarantee of unvarying excellence, each objective, before leaving the works, is subjected to severe scientific test. Bausch & Lomb Objectives and Eyepieces for use with the Polarizing Microscope are selected for strain-free characteristics. Not only are the optical materials chosen with this in mind, but special attention also is given to the mounting.

Catalog Number	Code Word	Polarizers (without retardation plates) and Analyzers
31-57-23	Acozn	Polarizer, style C
31-57-25	Ajadh	Polarizer, style E
31-57-26	Adyah	Polarizer, style F
31-57-28	Ahepr	Polarizer, style H
31-57-05	Acpew	Analyzer, style A
31-57-06	Acpix	Analyzer, style B

The following retardation plates, in metal mounts, are for use with polarizers C, E and H		
31-57-41	Ajbaz	Quartz, value approximately 147 mμ
31-57-42	Ajbeb	Quartz, value approximately 550 mμ
31-57-43	Ajbic	Quartz, value approximately 565 mμ

Micrometers		
31-16-01	Acoky	Eyepiece Micrometer ruled to 5mm in 0.05mm divisions, with every twentieth line numbered, standard diameter
31-16-26	Ahetv	Same, but for large diameter eyepiece
31-16-02	Acolz	Eyepiece Micrometer ruled to 10mm in 0.1mm divisions, with every tenth line numbered, standard diameter
31-16-27	Ahevz	Same, but for large diameter eyepiece
31-16-90	Ahurw	Stage Micrometer (glass) 2mm, graduated 0.01mm

Measuring Accessories		
31-51-40	Acebm	Universal Holder and Positive Eyepiece used with the following
31-51-42	Acecn	Graduated Quartz Compensator to measure bi-refringence
31-51-44	Acedp	Bi-quartz Wedge Plate
31-51-48	Acegs	Cap Analyzer with 2° graduations
31-51-50	Aceht	Sliding Stop Eyepiece
31-51-46	Acetr	Co-ordinate Grating, 0.1mm divisions
31-51-43	Ajses	Johannsen Compensator

Strain-Free Objectives							
Catalog Number	Code Word	Mag. No.	Objectives E.F. in mm	Type of Objective	N.A.	Working Distance in mm	
31-09-07-01	Ahbex	2.6	40 Achromatic	Dry	0.08	43.5	
31-09-09-01	Ahboz	4	32 Achromatic	Dry	0.10	38	
31-09-18-01	Ajtet	6	22.7 Achromatic	Dry	0.17	15.5	
31-09-22-01	Ahubub	10	16 Achromatic	Dry	0.25	7.0	
31-09-27-01	Ahcax	21	8 Achromatic	Dry	0.50	1.6	
31-09-31-01	Ahcey	45	4 Achromatic	Dry	0.85	0.3	
31-09-33-01	Ahciz	36	4 Achromatic	Dry	0.95	0.25	
31-09-71-02	Ahcob	97	1.8 Achromatic	Oil	1.25	0.14	
31-09-73-02	Ajtas	98	1.8 Fluorite	Oil	1.30	0.13	

Focusing Huygenian Eyepieces (Standard Diameter)				
Catalog Number	Code Word	Mag. No.	Approximate E.F. in mm	
31-15-21	Ahday	5 with Cross Hair	50	
31-15-23	Ahdez	7.5 with Cross Hair	33	
31-15-25	Ahlel	10 with Cross Hair	25	
31-15-27	Ahlij	12.5 with Cross Hair	20	
31-15-19	Ajsuw	5 with Cross Hair and Iris Diaphragm	50	
31-15-17	Ahers	7.5 without Cross Hair to take micrometer disc		
31-15-18	Akbig	10× without Cross Hair to take micrometer disc		

Focusing Huygenian Eyepieces (Large Diameter for Use with LC Microscope)				
31-15-31	Ahdud	5 with Cross Hair	50	
31-15-32	Ahebc	7.5 with Cross Hair	33	
31-15-33	Ahedc	10 with Cross Hair	25	
31-15-34	Ahedf	12.5 with Cross Hair	10	
31-15-37	Ahest	7.5 without Cross Hair to take micrometer disc		



First Order Red Retardation Plate

Quarter Wave Retardation Plate

Cap Analyzer

Disc Polarizer

Cap Polarizer

BAUSCH & LOMB POLAROID ACCESSORIES

THE Bausch & Lomb Polaroid Micro Accessories fit practically any standard (biological type) microscope for a wide variety of interesting and valuable work with polarized light. They serve as inexpensive substitutes for Nicol Prisms in some kinds of work.

These Polarizers are made from selected Polaroid material, accurately mounted, without strain, between measured, white optical glass—ground and polished.

The Cap Polarizer, No. 31-57-14, was designed primarily for use on simple compound microscopes without substage fittings. In use, it is inserted into the stage aperture and rests upon the disc diaphragm, slightly below the stage surface level.

The Disc Polarizer, No. 31-57-15, fits into the slotted ring beneath the substage iris diaphragm and is the same diameter as the blue glass moderating disc regularly supplied. This Polarizing Disc is mounted in a

metal ring with a handle for convenience in handling.

The Cap Analyzer, No. 31-57-11, also consists of a disc of selected Polaroid material, permanently cemented between strain-free plates. It fits over any standard eyepiece. The clear aperture permits the use of any power eyepiece without restricting the field.

White lines on the polarizers and analyzer indicate the plane of vibration so that the positions for maximum transmission or absorption are easily recognized. The minimum equipment for work with polarized light consists of the analyzer and one or the other of the polarizers, depending upon the microscope with which it is to be used.

Although the simple combination of polarizer and analyzer can be used to detect whether a material is isotropic or anisotropic, the addition of the two retardation plates offered greatly extends the range and variety of interesting work possible.

The mountings of the retardation plates fit inside the mount of the cap analyzer and are provided with pins for proper positioning.

Retardation Plate, No. 31-57-45, is red of the first order. It is used to detect weak double refraction, to estimate the order of interference color in Newton's scale and to determine the fast and slow axes of the specimen. This is also a very attractive addition to the microscopist's outfit, due to the vivid color effects provided.

The Quarter Wave Retardation Plate, No. 31-57-44, is used to determine whether a crystal is positive or negative by observing the interference figure at the back of the objective when the eyepiece is removed. This retardation plate is also used to determine whether optically active substances are dextrorotatory or laevorotatory.

Polaroid is covered by United States Patents Nos. 1918848; 1989371; 1951664; 1956867; 2011553 and others pending.

Catalog Number	Code Word	Specifications
31-57-14	Ajifl	Cap Polarizer
31-57-15	Ajigm	Disc Polarizer
31-57-11	Ajldk	Cap Analyzer
31-57-45	Ajikr	First Order Red Retardation Plate
31-57-44	Ajihn	Quarter Wave Retardation Plate
31-57-02-14	Ajimt	Polarizing Equipment, consisting of Cap Polarizer and Cap Analyzer, in case
31-57-02-15	Ajinv	Polarizing Equipment, consisting of Disc Polarizer and Cap Analyzer, in case

BAUSCH & LOMB POLAROID ACCESSORIES

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Spectrophotometers
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Glass to meet the exacting specifications for all types of scientific instruments is made in the Bausch & Lomb Glass Plant, the only one of its kind in America.

Orthogon "wide vision" eyeglass lenses, designed by the Bausch & Lomb Scientific Bureau, afford perfect correction from center to edge. Enjoy their advantages—ask for them the next time you have your eyes examined.

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Price List for Catalog D-130

POLARIZING MICROSCOPES and ACCESSORIES

January 1, 1940

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BAUSCH & LOMB

OPTICAL COMPANY - - - ROCHESTER, N. Y., U. S. A.

Catalog Number	Code Word	Price	Catalog Number	Code Word	Price	Catalog Number	Code Word	Price
Page 7			Page 9(Cont.)			Page 18 (cont.)		
31-28-51-01*	Ajzh	\$270.00	Pinhole cap for LA Microscope, \$2.50.			31-57-05	Acpev	\$30.00
31-28-51-02*	Ajpan	277.50	Rotatable Analyzer, extra, \$15.00.			31-57-06	Acpix	44.00
31-28-51-04**	Ajpep	295.50	Page 11			31-57-41	Ajbaz	6.00
31-28-51-51*	Ajpir	283.50	31-28-58-02 Ajsar \$416.00			31-57-42	Ajbeb	6.00
31-28-51-52*	Ajpos	291.00	31-28-58-04 Ajsov 437.50			31-57-43	Ajbic	6.00
31-28-51-54**	Ajput	309.00	31-59-54 Ahefg 50.00			31-16-01	Acoky	3.00
31-51-68	Accah	6.50	31-58-40 Ajocl 56.00			31-16-26	Ahetv	3.00
31-58-74-28	Ajory	12.50	31-58-42 Ahapp 65.00			31-16-02	Acolz	3.50
31-59-54	Ahefg	50.00	31-51-68 Accah 6.50			31-16-27	Ahevz	3.50
31-51-43	Ajses	38.00	Focusing Stage can be supplied at extra cost.			31-16-90	Ahurw	7.00
31-51-54	Accik	4.00	Pinhole cap for LB Microscope, \$2.50.			31-51-40	Acebm	42.00
31-51-56	Ahamm	28.00	Page 14			31-51-42	Acecn	37.50
31-51-60	Ahann	5.00	31-28-61-02 Ahelm 546.00			31-51-44	Acedp	53.00
31-59-30	Ahaff	7.50	31-28-61-04 Agmad 565.00			31-51-48	Acegs	29.00
31-34-89-93	Acraw	21.50	31-59-54 Ahefg 50.00			31-51-50	Aceht	37.50
31-57-27	Ahavv	30.00	31-58-41 Ajudm 58.50			31-51-46	Acefr	25.00
31-08-21-01	Ahazz	12.50	31-58-42 Ahapp 65.00			31-51-43	Ajses	38.00
31-08-31-01	Ahbaw	21.75	31-19-12 Ajtiv 5.00			Page 19		
Other powers—prices on request.			31-59-75 Ajacg 387.00			31-09-07-01	Ahbex	9.00
*Priced with 7.5× eyepiece instead of 12.5× as listed.			31-51-43 Ajses 38.00			31-09-09-01	Ahboz	9.00
**Priced without 12.5× eyepiece.			31-51-49 Ajsit 18.00			31-09-18-01	Ajtet	11.50
Pinhole cap for M Microscope, \$2.50.			Focusing Stage can be supplied at extra cost.			31-09-22-01	Ahbub	11.50
Tube Analyzer (non-rotatable) in place of Cap Analyzer, \$15.00.			Pinhole cap for LC Microscope, \$3.00.			31-09-27-01	Ahcax	17.50
Page 9			Page 16			31-09-31-01	Ahcey	20.00
31-28-54-12	Ajrot	338.50	31-28-57-02 Acclaj 903.00			31-09-33-01	Ahciz	20.00
31-28-54-14†	Ajruv	360.00	31-28-57-04 Accldek 926.50			31-09-71-02	Ahcob	42.00
31-51-68	Accah	6.50	Page 17			31-09-73-02	Ajtas	78.00
31-58-74-28	Ajory	12.50	31-59-75 Ajacg ne. 387.00			31-15-21	Ahday	7.50
31-59-54	Ahefg	50.00	31-59-54 Ahefg 55.00			31-15-23	Ahdez	7.50
31-51-54	Accik	4.00	Page 18			31-15-25	Ahlel	7.50
31-51-56	Ahamm	28.00	31-57-23 Acozn 30.50			31-15-27	Ahlij	9.50
31-51-60	Ahann	5.00	31-57-25 Ajadh 49.00			31-15-19	Ajsuw	19.50
31-59-30	Ahaff	7.50	31-57-26 Adyah 62.50			31-15-17	Ahers	5.75
31-34-89-93	Acraw	21.50	31-57-28 Ahepr 30.00			31-15-18	Akbig	5.75
31-57-27	Ahavv	30.00	Other powers—prices on request.			31-15-31	Ahdud	10.00
31-08-21-01	Ahazz	12.50	†Priced with 2.6× (40mm) objective and 5× eyepiece in place of 4× (32mm) objective and 12.5× eyepiece as listed.			31-15-32	Ahebc	10.00
31-08-31-01	Ahbaw	21.75	Page 20			31-15-33	Ahedc	10.00

